2000

Effects of modeling on retention and transfer of two motor tasks

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EFFECTS OF MODELING ON RETENTION AND TRANSFER OF TWO MOTOR TASKS

A Thesis

Presented to

The Faculty of

The Graduate Program in Human Factors/Ergonomics

San Jose State University

College of Graduate Studies

In Partial Fulfillment

of the Requirement for the Degree

Master of Science

By

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Dec. 2000

UMI Number: 1402999

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ABSTRACT

THE EFFECTS OF MODELING ON RETENTION AND TRANSFER OF TWO MOTOR TASKS

By A. Suaifa Imam-Jaber

Learning following modeling on a sample of atypical children was explored. This study extended the learning benefits of passive modeling researched by Biederman (1991, 1994,1998) to include retention and transfer of learning two motor skills.

Researchers revealed that the typical teaching method for motor learning with atypical populations has been interactive modeling. Biederman's research warranted a new perspective. He concluded that learners, receiving passive modeling outperformed learners in interactive modeling. However, Biederman fell short of supporting his claim because retention and transfer were not measured by him. This study attempted to uncover the effects of passive and interactive modeling on learning by measuring retention and transfer. A significant interaction of the transfer task by modeling technique was found. Participants did best on the transfer task resembling the task learned when modeling was interactive. The findings supported an interactive learning approach for atypical children.

AKNOWLEDGEMENTS

I would like to thank Dr. Emily Wughalter for all her patience, understanding, and time she gave with me. Without her drive I would probably need another fifteen years to complete my thesis. She had the foresight in avoiding potential disasters; saving me extra work. She truly is an inspirational force! I would like to thank Dr. Pamela Richardson, OTR, for all her advice on the initial setting-up of the experiment and her suggestions for using upper extremity motor tasks and Dr. Nancy Megginson for all of her valuable contributions. Thank you!

DEDICATION

What a great feeling when a long time goal is accomplished! Since my graduation in 1988, I have wanted to continue my education. However, this took a back seat to my marriage and my growing family. Now fifteen years later I have crossed the finish line, and proudly!

I did not travel this long road alone. A group of dedicated people spent much of their time helping me. First, I would like to thank my parents for leaving their lives overseas, and dedicating the last two years to their three grandchildren. They have enriched my children's lives with their life experiences and pearls of wisdom. They have ultimately taught us the true meaning of family and love. I love you mom and dad!

To my three children who gave up "weekends with mom", who tried to keep themselves busy and quiet, and who really showed me how mature and understanding they truly are. I love you so very much!

To my extended family, aunts, uncle and grandmother who opened their homes and hearts to me. Thank you all!

Last but not least, to my husband who has been and always will be my strength. I love you!

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CHAPTER I

Introduction

A typical teaching method adopted for atypical/special populations in instructional settings is the interactive modeling technique (Burger, Blackman, & Clark, 1981; Charlop, Schreibman, & Thibodeau, 1985; Robertson & Biederman, 1989). This method involves the trainer leading the performer through each step of a task while giving verbal feedback for near goal successes (Bandura, 1969; Biederman, Davey, Ryder, & Franchi, 1994). In addition, children are encouraged to look at what they are doing, while being given positive verbal feedback for what the instructor believes to be appropriate attention to the task. Other remedial techniques use modeling, imitation, learning-by-doing, and observational learning approaches; however, the assumption is that interactive modeling is the most effective technique for children with a variety of disorders such as developmental delays, Down syndrome, and autism (Burger et al. 1981; Charlop et al. 1985; Omizo, Cubberly, & Cubberly, 1985).

In three separate studies by Biederman and colleagues (Biederman, Davey, et al. 1994; Biederman, Fairhall, Raven, & Davey, 1998; Biederman, Ryder, Davey, & Gibson, 1991) the interactive modeling approach was challenged. These researchers claimed that passive modeling required less effort and less time from the instructor than interactive modeling. The passive modeling technique involves the trainer to demonstrate the task while the participant observes the task (Biederman et al. 1991). The researchers videotaped the performances of the participants and recruited first year psychology students as judges. The psychology students were instructed to rate the performances of the children based on a 5 point Likert-type scale, with a score of 1 indicating clear preference for task one, 5 indicating a clear preference to the second task, and 3 indicating no difference between the tasks. The scores collected were then compared and a mean rating score was tabulated. Results indicated that tasks trained in passive modeling were performed significantly better than tasks trained in the interactive modeling condition. Hence, the experimental group of children with developmental delays who received passive modeling "outperformed" those who received interactive modeling.

Robertson et al. (1989) reviewed 65 remedial experimental studies of modeling in instructional settings showing little consistency in outcome with respect to the use of various modeling strategies. Interactive modeling with verbal reinforcements was also found to have a negative effect on motor task performance with respect to children with developmental delays (Biederman, Davey, et al. 1994; Biederman, Fairhall, et al. 1998). Biederman and colleagues (1994, 1998) clarified these negative effects on learning as 'over-justification' caused by attention problems or delays in processing verbal information that may affect children with developmental delays. Children with developmental delays may misunderstand the circumstances underlying the reinforcement/verbal prompts used by instructors/therapists, therefore, disrupting the learning process. With a passive modeling technique, verbal reinforcement was withheld during the task instruction, eliminating the 'over-justification' effect. The objective of passive modeling was for children to be observers while the task was being explained, and then to allow children to imitate the task without providing verbal reinforcement or verbal prompts (Biederman et al. 1991).

It was interesting to find that none of the experiments conducted by Biederman and colleagues (1991, 1994, 1998) included an examination of the retention or transfer phases of learning. Since Biederman and colleagues' objectives were to evaluate the effectiveness of using interactive modeling versus passive modeling in learning, it is logical that knowledge retained by the participants, as well as their transfer capabilities should be of concern in these studies.

Statement of Problem

If passive modeling was a better technique than interactive modeling, then such a claim should be measured in the retention and transfer phase of learning. The benefits of passive modeling should be reflected in the amount learned through this method of teaching.

Purpose of the Study

The purpose of this study was to examine the effects of passive and interactive modeling techniques in the retention and transfer phases of learning of two upper extremity motor skill tasks for children diagnosed with developmental delays.

Hypotheses

The following two null hypotheses were investigated in the study:

1) Modeling technique used to teach an upper extremity motor skill would not affect scores on the task benchmark scale for the retention phase of learning.

2) Modeling technique used to teach an upper extremity motor skill would not affect scores on the transfer task benchmark scale for the transfer phase of learning.

Definition of Terms

The following definitions explain the terms used in this study:

Interactive Modeling Technique. This method was defined by Biederman et al. (1994) as a technique of physically leading a child through each step of a task while prompting the child to look at what he or she is doing. Verbal prompts were provided for appropriate attention to the task, and also when the task was completed. Other synonyms for interactive modeling are: hand-over-hand, active modeling, coactive modeling, and participant modeling.

Passive Modeling Technique. This method of training was described by Biederman et al. (1994) as a technique that included an adult model performing a task while a child watches without interacting with the task or with the adult model. The model provided instructions through verbal communication in a highly consistent manner so that the observing child could clearly hear and understand the instructions. The child was asked not to copy the model, but to just sit and observe the task being performed. Another synonym for passive modeling is: observational modeling.

Developmental Delay. Developmental delay is the maturation lag, a slower rate of development in which a child's functioning level is below that of a normal child of the same age. Developmental delay has been primarily associated with children exhibiting mental retardation (Reynolds & Mann, 1987a). For the purpose of this study the participants have a secondary diagnosis of Developmental Delay that is caused by the primary diagnosis.

Mental Retardation. Mental retardation is defined as: ".... significantly sub-average general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period. Developmental period is defined as the time between conception and the eighteenth birthday. General intellectual functioning is defined as the results obtained after general intelligence test such as the Stanford-Binet Intelligence Scale or the age-appropriate Wechsler scale.

Sub-average intellect is defined as full-scale IQ of no more than approximately 70." (Reynolds & Mann, 1987b). Mild mental retardation is defined as individuals with an IQ range of 55 to 70.
Severe mental retardation is defined as individuals with an IQ range of 35 to 55.

Performance. Performance was measured as it related to aspects of movement patterns, "... that determines the success of the action in terms of the environmental goal" (Schmidt & Young, 1991, p. 13-14). Performance "... does not always indicate the amount of learning that has occurred ... performance variables only temporarily affect performance" (Proctor & Dutta, 1995, p. 325). The Task Benchmark Scoring Scale was developed to measure the motor skills studied here.

Learning. Shute and Gawlick (1995) defined learning or skill acquisition as a representation of a "... change in a person that occurs at a particular time as a function of experience or practice. Because it is not directly observable, learning must be inferred from performance on a memory test, in which the retention interval may be immediate or delayed" (p. 781). "Learning can be demonstrated by showing improved performances under different training conditions on retention trials, for which performance of the skill is tested following a delay" (Proctor et al. 1995, p. 325). In this study, learning was measured through acquisition, retention and transfer phases of learning.

Delimitations

The following delimitations were placed on the study:

1. The participants ranged in age between 5 and 8 years.
2. The mental IQ of the participants ranged between 40 and 55, with deficits in adaptive behavior, labeling the participants as persons with severe mental retardation with deficits in adaptive behavior.
3. The participants had adequate upper extremity function. This was evaluated at the researchers' discretion.
4. Autistic children were not selected to participate in this study, due to their difficulties with auditory and cognitive perceptual deficits.
5. The two motor tasks were exclusive to upper extremity activities of daily living (ADL).

Limitations

The following limitations were placed on the current study:

1. Participants' motivations were not controlled.
2. Participants were diagnosed with developmental delays that included Down syndrome and mental retardation.
3. The effect of medication on performance of participants was not controlled.
4. Results are not applicable to other diagnoses.

5. Although parents were asked to sign a waiver " I will not help", the researcher could not monitor follow through at home. The task washing hands is a hygienic issue; the possibility of parents assisting was uncontrollable by the researcher.

Summary

The most frequent method of teaching skills to children diagnosed with developmental delays is the interactive modeling technique. Biederman and colleagues (1994) challenged this method by introducing a procedure that is "effortless and less time consuming" (p. 457), the passive modeling technique. They asserted that with this technique, children diagnosed with developmental delays outperformed their counterparts receiving interactive modeling. However, in the practice of skill acquisition, performance did not equate to learning. Therefore, if passive modeling was to be substituted for the interactive modeling technique, then the only methodological means of measuring the process of learning resides in retention and transfer phases of learning.

CHAPTER II

Review of the Literature

The realization of this research thesis was attributed to the work of G. B. Biederman and colleagues (1991, 1994, 1998). In three studies, the concept of passive modeling was shaped in response to the prevailing interactive modeling technique. Biederman and colleagues obtained surprising results and made some recommendations. Since this research study was based on prior empirical findings of Biederman and colleagues' research, this chapter reviewed the following three issues: a) the use of observational modeling and its effectiveness for children with developmental delays, b) the use of interactive modeling and its effectiveness for children with developmental delays, and c) the significance of replicating Biederman and colleagues' experiments (1991, 1994, 1998) on passive modeling that included retention and transfer phases of motor task acquisition.

The Use and Effectiveness of Observational Modeling

Historically, modeling was used in the realm of behavioral psychology, more specifically in behavior modification, such as attention span (Norton & Lester, 1979), impulsiveness (Meichenbaum & Goodman, 1971), and fear (Bandura et al. 1969). Its role was also recognized in theories of socialization, personality formation and cognitive development (Robertson et al. 1989). Using modeling for the instruction of children with mental retardation was recommended and supported by a large number of early research studies in a variety of instructional settings; imitating live or videotaped models demonstrating social skills (Talkington & Altman, 1973), self-help skills using a telephone (Stephan, Stephano, & Talkington, 1973), solving fine-motor problems (Turnure & Rynders, 1973) and paired-associated-learning tasks (Greeson & Jens, 1977). This is a brief sample of how modeling is used in a wide spectrum of behavioral modification studies, in theories of socialization, in instructional studies, and in special education. The above studies have provided support for the success in applying modeling as a technique to learning.

It was generally accepted that a child " initially matches behaviors of others and if this matching is reinforced, the behavioral matching in general becomes rewarding " (Kuhn, 1973, p. 158). The observed behavior becomes incorporated into the child's behavioral repertoire. The acquisition of any new behavior or task requires the observer to attend to the demonstration and then store the information so that it could be used later. Because most children with cognitive disabilities also have attention deficits (Kuhn et al. 1973), the effectiveness of modeling by observation is questionable. Nevertheless, learning by observation was used in studies with children diagnosed with autism (Charlop, Schreibman, & Tryon, 1983; Tryon & Keane, 1986), children with learning disabilities where observational modeling was compared to interactive modeling (Omiza et al. 1985), and with children diagnosed with Down syndrome (Sarimski, 1982). The studies using children with autism as participants indicated favorable results if the model was autistic and of similar age, i.e., peer modeling. In the study by Omiza et al. (1985) using children with learning disabilities as participants, the results indicated greater success with interactive modeling than with learning by observation. Results of the study by Sarimski et al. (1982) using children with Down syndrome and those with other diagnoses (not specified in the study) as participants indicated no significant differences between their performances. It is noteworthy to mention that the inconsistencies of the results provide a poor argument in favor of learning by observation.

The Use and Effectiveness of Interactive Modeling

Interactive modeling appeared to be first cited by Bandura et al. (1969). In this original study, Bandura introduced a group of subjects undergoing treatment for snake phobia to a model handling a snake without showing fear. The two experimental groups, adults with developmental delays and those without developmental delays, were led to observe themselves handling the snakes. In comparison to groups receiving several other modeling treatment, such as symbolic modeling, systematic desensitization, or no treatment, Bandura's use of interactive modeling in removing phobic responses was optimal for the adults without developmental delays. Although interactive modeling appeared to be less effective for people with developmental delays than for people without developmental delays, the introduction of interactive modeling stimulated new research, and quickly interactive modeling was applied to children with developmental delays (Gladstone & Spencer, 1977; Omizo, Chubberly, et al. 1985; Omizo, Rander, et al. 1983). Gladstone et al. (1977) applied interactive modeling in teaching novel skills to children with developmental delays. They trained the participants in a no modeling task, hand-and-face washing, and a modeling task, teeth brushing. Though the purpose of the experiment was to "evaluate the effects of a model's demonstration of response-contingent praise" (p. 76), the results of the study indirectly and subjectively confirmed that the interactive modeling technique was an important tool for teaching novel skills. Other remedial modeling techniques were being applied to the special education realm, such as learning arithmetic (Omizo et al. 1985) and language (Burger et al. 1981), as well as in cognitive training such as concept acquisition (Norton & Lester, 1979), perceptual differences (Meyer, Day, & Lee, 1992) and performance of community services, such as banking (McDonnell & Ferguson, 1989); however, the interactive modeling technique seemingly received great results as a training tool with people with developmental delays. Meyer and Kohl (1985), specifically examined interactive modeling and its effectiveness for children with disorders such as developmental delays, Down syndrome, and autism. Meyer et al. concluded that interactive modeling was indeed an effective training tool for children with developmental delays. It is noteworthy to mention that the results of interactive modeling appeared to have the advantage in modeling techniques.

Biederman and Colleagues' Experiments

The experimental foundations of Biederman and colleagues' research studies (1991, 1994, 1998) were designed following Robertson et al. (1989) meta-analysis of 65 studies. The studies reviewed were published between 1979 and 1988 and involved modeling, imitation, and observational learning in special populations. The purpose of this meta-analysis was to evaluate the efficiency of the modeling techniques being used in skill acquisition. Yet, Robertson et al. (1989) failed to find support of efficiency or reliability that any single modeling strategy was effective. The foundation for such results was found in the methodological limitations of the experiments.

Robertson et al. (1989) discovered that many of the studies lacked experimentation strategies that gave internal validity to the research designs. The absence of baseline data and control groups made it difficult to attribute the effect of the independent variables on the dependent variables. Other shortcomings included confounding of dependent and independent variables, small sample sizes, biases, and non-random assignment of subjects. Therefore, it was not surprising that current literature concerning modeling techniques with special populations is inconsistent. The literature did not clarify the nature or function of modeling within these populations. From these premises, Biederman et al. (1991) designed the first of three experiments that assessed the "relative efficiency of active and passive modeling in an internally valid within-subject experimental design in a population of developmentally delayed children"(p. 177). In this experiment, 12 children with developmental delays were trained in two novel tasks. One task was presented using a passive modeling technique with verbal prompts and the other task in an interactive modeling technique with verbal prompts. Following 40 practices of 1 hour training sessions, the subjects were asked to perform both tasks. Performances were videotaped. The videotapes were then shown to 35 student volunteers who were instructed to rate the performances of each child on a 5 point scale. No information about the subjects was given, nor information about what constitutes good performance. The mean ratings of the 35 judges indicated that tasks trained in passive observation were performed significantly better than tasks trained in the interactive modeling approach. The explanation given for the success of passive observation was the possible confusion the children experienced from the interactive modeling criterion plus the delivery of verbal prompts. To further prove the effectiveness of passive observation, Biederman et al. (1994) replicated Biederman et al. (1991) study to determine if the deliverance of verbal prompts played a negative role in task acquisition in the two modeling techniques.

Biederman et al. (1994) recruited 12 children with developmental delays and randomly assigned 6 children to the interactive modeling condition that delivered verbal prompts at each successful benchmark, and assigned 6 children to the passive modeling condition that delivered no verbal prompts. Following 14 sessions of 30 minutes of training per session, the children were asked to perform the two tasks and their performances were videotaped. The tapes were then shown to 104 student judges who were asked to rate the children's performances based on a 5 point scale. The mean rating of the 104 judges confirmed the findings of the 1991 study; children trained in the passive modeling performed better than the children trained in the interactive modeling. In addition, results of the study supported Biederman et al. (1991) claim that verbal prompts lead participants to confusion, and therefore, misinterpretation of the model's action. Therefore, Biederman et al. (1994) concluded that, " whatever the theoretical basis for our findings, which indicate that reinforced active modeling is counterproductive, it is clear that a reexamination of instructional practice is warranted "(p.465).

Following criticism of Biederman and colleagues' 1994 study where the use of verbal reinforcement was used as an independent variable (Ward, 1995), Biederman et al. (1998) conducted a study in which guidelines constituting verbal reinforcement were standardized. The purpose of the study was to replicate the 1994 study by Biederman and colleagues "using more rigorous and clearly defined criteria for the delivery of verbal prompts" (p. 456). As in the previous two studies, they found that children who were trained in passive modeling without verbal prompting performed better than the children who were trained in interactive modeling with verbal prompting.

Although Biederman and colleagues conducted and replicated the study three times (1991, 1994, 1998), the studies fall short of providing a full picture of true acquisition of learning. Kuhn et al. (1973) stated that, “acquisition ... is an unobservable variable. It is impossible to ascertain that a behavior has been acquired unless it is performed. Hence, a measure of acquisition must in reality be some type of performance, and the measure is tangible “ (p. 159). In the practice of skill acquisition, the only means of inferring about the learning process is with retention of information and transfer of learning. From this assumption, there appears to be a misstatement in Biederman et al. (1994) claim for "...a reexamination of instructional practices... " (p. 462). Following the review of literature the present study was designed to replicate Biederman et al. (1998) study with the addition of an examination of both passive and interactive modeling techniques in retention and transfer phases of learning.

Summary

According to the literature review, current trends in training children with special needs have been with the interactive modeling technique. Yet little evidence has supported its effectiveness in training and educating the special population, as pointed out by Robertson et al. (1989) meta-analysis examination. Moreover, research by Biederman and his colleagues (1991, 1994, 1998) trained children with developmental delays in the interactive and passive modeling approaches. The passive approach was found to be a more efficient training tool than the interactive approach; however, retention and transfer were not examined in these studies.

Literature on motor skill learning demonstrated that few studies assessed such topics. In Robertson et al. (1989) meta-analysis they examined 65 studies, which analyzed where modeling was used as a training tool, 15 studies used motor tasks. Only 3 of the 15 motor skill studies used children as participants, one study used children with Down syndrome and the two other studies used children with autism. The literature reviewed in this chapter indicated the necessity for focused, precise and reliable experimental methodology. This was nowhere more visible than in the instruction and training of children with special needs, especially those with developmental delays.

CHAPTER III

Methods

The purpose of this experiment was to examine the effects of interactive modeling and passive modeling in the retention and transfer phases of motor skill learning for children with developmental delays. Included in this chapter are the criteria for selection of subjects, the research design, the procedural guidelines for administrating the motor skills tasks, and the methods for analyzing the data.

Participants

Eight children diagnosed with developmental delays, four males and four females participated in the study. The children ranged between the ages of 5 and 8 years, and attended the special education program at an elementary school in a large metropolitan area in Jerusalem, Israel. The children's mental IQs ranged between 40 and 55 and, therefore, were labeled as persons with severe mental retardation (Appendix A). Following permission and approval from the Human Subject-Institutional Review Board of San Jose State University (Appendix B), a proposal requesting facility use from the elementary school board was submitted in order to conduct the study on the school premises (Appendix C). The primary special education classroom teacher was involved in recruiting subjects appropriate for the study; however, final approval of participants was at the researcher's discretion as dictated by participant criteria listed in the limitation and delimitation sections of the study. A letter was sent to parents with information about the study, highlighting the benefits their children would receive from participating in the study (Appendix D). Subsequently, consent forms were signed by the parents permitting their children to participate in the study (Appendix E).

Prior to beginning the experiment, a parent/researcher/teacher meeting was conducted to further elaborate on the objectives of the study. At the meeting, the parents were informed of the tasks their children would be performing, the techniques they would be trained in, and the expected outcome of the study. The parents were also advised not to train or teach the "experimental tasks" at home, until the research was completed, and the parents were asked to sign "I will not help..." slip (Appendix F). Furthermore, the meeting was opened for the parents to ask questions and express concerns.

Research Design

Research Tasks

Each child was trained to perform two tasks, washing hands and donning a coat. Both tasks were presented to the children using the 8 point, Task Benchmark Score Sheet Washing Hands (Appendix G), and the 8 point Task Benchmark Score Sheet Donning Coat (Appendix H). Similarly, the performance of the children on the two tasks was scored using the 8 point Task Benchmark Score Sheet for Washing Hands and Donning a Coat. Face validity was measured by sending the Task Benchmark Score Sheets to four experts: two experts from the field of special education and two experts from the field of Occupational Therapy (Appendix I). Feedback from these experts was obtained in the form of a Task Benchmark Scoring System Face Validity Questionnaire that was provided in the Task Benchmark Scoring System evaluation packet.

Based on the Task Benchmark Scoring System Face Validity Questionnaire, data analyses were divided into two sections: a) question 1 was divided into a and b subsections; a 3 point scale was used and analyzed using quantitative methods, b) questions 2-4 were subjective questions and were analyzed using qualitative methods. The results of the experts' critical comments were used to improve the Task Benchmark Scoring Systems in order to measure the effectiveness of the modeling techniques.

Pretest

Prior to beginning the acquisition phase of the study, all of the participants were required to demonstrate their ability to wash hands and don a coat. This pretest was administered for a period not exceeding 10 minutes. Physical assistance and verbal prompts were not provided during the pretest. Scores were given according to the Task Benchmark Scoring

Sheet Washing Hands (Appendix G) and Task Benchmark Scoring Sheet Donning a Coat (Appendix H). The participants' pretest scores were used as the covariate to calculate an analysis of covariance (ANCOVA).

Acquisition Phase

During acquisition trials, one of the upper extremity motor skill tasks was administered to the children in the interactive modeling technique condition. This technique required the trainer to physically guide the child through the tasks while positive verbal prompts were delivered (Biederman et al. 1994). The verbal prompts were delivered only when benchmarks were achieved by the child. The verbal prompts were provided within 5 seconds of the achievement of the benchmark (Biederman et al. 1994). The other upper extremity motor skill task was administered in the passive modeling technique. This training condition permitted the instructor to demonstrate the task while the child was seated and observed the demonstration (Biederman et al. 1994). Throughout the demonstrations, verbal prompts were not provided. The acquisition sessions lasted for a minimum of 10 minutes and a maximum of 20 minutes, over a period of two weeks.

Since some of the participants may have suffered from attention deficits, the researcher directed the attention of the participants to the task, whether the child was receiving interactive or passive modeling training. The verbal prompts delivered were those used by the primary teacher during class time. Consequently, consistency and familiarity were maintained for the participants. When attention was obtained, a positive verbal prompt was provided.

Retention Phase

The eight participants performed four retention tests. All four retention tests began with verbal instructions. These instructions informed the participants of what was expected during that particular testing session. These instructions informed the child that the researcher would not help during the test. Following the testing phase, the researcher provided physical assistance and positive verbal reinforcements to those participants who did not successfully complete the motor tasks. This intervention by the researcher helped in decreasing anxiety, distress, and frustration of the children.

The first retention test was performed at the end of the first week of acquisition immediately following the first four days of acquisition learning. The second retention test was performed at the end of the second week of acquisition immediately following the second four days of the acquisition phase. The third and fourth retention tests were performed two days following the second retention test. This testing session combined both performances of the motor tasks. During the four retention tests, the children were asked to perform the motor tasks without physical guidance or verbal prompting. The children were given a maximum of 20 minutes to perform each of the tasks. The researcher then scored the performances of each of the children according to the 8 point Task Benchmark Scoring Sheet on each of the motor tasks, washing hands and donning coat. If the child did not complete the task within the allowed time, the testing session was stopped. The final score was graded according to the child's accomplishment of the task within the 20 minutes period. However, when a child completed the task within the specified time of 20 minutes, a score of 8 was given.

Transfer Phase

The transfer phase was scheduled on the following day after the third retention test session of the study. During the transfer phase, the children were required to perform two comparable novel upper extremity motor skill tasks: washing a plastic cup and donning a cardigan. The children were required to perform the two transfer tasks without any physical guidance or verbal prompting. The researcher scored the transfer performance of each of the children according to the 8 point Transfer Task Benchmark Scoring Sheet Washing a Cup (Appendix J) and 8 point Transfer Task Benchmark Scoring Sheet Donning a Cardigan (Appendix K). Each child was given a maximum of 20 minutes to complete the two transfer tasks. If the child did not complete the transfer task within the allowed time, the transfer test was stopped. The final score was graded according to the child's accomplishment of the transfer task within the 20 minutes period. When a child completed the transfer task correctly within the 20 minutes period, a score of 8 was given. Following scoring, the researcher physically assisted the children with completing the transfer tasks. Verbal reinforcements were provided to decrease frustration and distress of the children who did not complete the required transfer motor tasks successfully. Hence, this provided the children with a sense of accomplishment and self-confidence.

Procedure

Two upper extremity motor tasks, washing hands and donning coat, were pre-chosen by the researcher for the purpose of this investigation. Eight children with developmental delays served as participants for the study. All eight children received a blocked order of training for the two motor tasks. Four children were randomly assigned to an interactive modeling followed by a passive modeling training condition, while the other four children were randomly assigned to a passive modeling followed by an interactive modeling training condition. While the children were in the interactive modeling practice, they received verbal prompts at successful benchmarks. While the children were in the passive modeling practice, they received no verbal prompts.

To insure methodological validity of the data, the researcher, with permission of the school administration and parents, reviewed school files and medical reports to obtain some insight into the participants' performances and medical conditions. With the assistance of the special education teacher and with background information of each child, an attempt was made to balance the experimental groups in terms of IQ, diagnosis, and mental/physical abilities.

Each of the eight children with developmental delays received blocked practice of 8 trials. Four children were randomly assigned for the interactive/passive modeling condition, and four children were randomly assigned for the passive/interactive modeling condition. The children received training in one motor skill task (i.e., washing hands or donning a coat) a day. The sessions were for a maximum of 20 minutes for four consecutive days, beginning on Monday and continuing through Thursday, with a retention test on Friday. For the following week, the training was replicated with the second motor task and in the other condition of modeling (i.e., donning coat or washing hands), with a second retention test on Friday. The following Monday the children performed the third retention test, which tested both motor tasks, washing hands and donning a coat.

The benefit of participating in this study was the opportunity to learn two self-care activities in two different teaching techniques, interactive and passive modeling techniques. Minimal risks were identified during this study. Magnitude of discomfort was no greater than encountered in daily life. Following any unsuccessful performances by the children the researcher provided immediate physical assistance and positive verbal reinforcements in order to reduce stress and to provide the children with a sense of accomplishment and self-confidence.

To minimize distraction during the acquisition sessions, each child was withdrawn from their classroom to an empty room in the school. The acquisition sessions were held on a one-to-one basis between the researcher and each child. To increase reliability of results all acquisition, retention and transfer phases were conducted by the researcher.

Following the completion of the transfer phase, each child was awarded a gold star (sticker) no matter the accomplishment. They were thanked for participating in the study and praised for their hard work and performances.

Positive Verbal Prompts

In the research design, verbal prompts were delivered only when the children successfully reached a benchmark during the interactive modeling condition. These verbal prompts included the following phrases: "Good girl ... Good boy ... Well done ... Good job". When the child performed inaccurately, no verbal emphasis was placed on the action, such as "No", "Not like that", "This is how you do this". The negative and undesired actions of the child were not emphasized by any reinforcement provided by the researcher.

Sample of One Experimental Trial

A child from the interactive modeling condition was trained in the task of washing hands by the researcher. The training session began by informing the child about the purpose of the session: " I will be teaching you how to wash your hands with soap and water. I will be taking your hands and showing you how to wash them. I want you to pay attention. When we are done, you can return to your class. Let's start". Following the instructions, the researcher began training the child, step by step, according to the 8 point Task Benchmark Scoring Sheet Washing Hands (Appendix G). When the child achieved a benchmark successfully, verbal prompts were provided from the researcher. Similarly, the child receiving the passive modeling condition began the session with the following statement by the researcher: "I will be showing you how to put on a coat. You will listen to my words and watch me. I want you to pay attention. When I am done, you can return to you class. Let's start". Following the instructions, the researcher modeled the task for the child, step by step, according to the 8 point Task Benchmark Scoring Sheet Donning a Coat (Appendix H). During the passive modeling by the researcher, no verbal prompts were delivered.

In the first two retention phases, each child was informed of the following: "I want you to wash your hands/put on your coat without me helping you or showing you. You have 20 minutes to finish. When you are done, you can return to your classroom. You can start now ". Following the instructions, the researcher scored the child's performance according to the 8 point Task Benchmark Scoring Sheet Washing Hands/Donning Coat.

In the third retention phase, each child received the same instructions as in the first two retention tests. However, two performances by each child were expected, washing hands and then donning a coat or visa versa, in a single testing session. Following each performance, the child was scored according to the 8 point Task Benchmark Scoring Sheet Washing hands and the 8 point Task Benchmark Scoring Sheet Donning Coat. When the child did not complete the motor task the researcher scored the retention performance and then immediately provided the child with physical assistance and verbal praise and reinforcements.

In the transfer phase of the study, each child was informed of the following: "Here is a cup/cardigan. I want you to wash the cup/put on the cardigan. I cannot help you. Do the best you can. You can start now". Following the instructions, the researcher scored the performance of each child according to the 8 point Transfer Task Benchmark Scoring Sheet Washing a Cup (Appendix J) and the 8 point Transfer Task Benchmark Scoring Sheet, Donning a Cardigan (Appendix K).

When the child did not complete the motor task, the researcher scored the transfer performance and then immediately provided the child with physical assistance, verbal praise, and reinforcements. This allowed the child to feel a sense of accomplishment and reduced frustration and distress.

Confidentiality

To insure complete protection of the participant's rights to confidentiality, every participant was assigned a numerical code. This code was then used in reference to the participant in the study. No names or specific physical descriptions were used to portray any of the participants. All personal information, consent forms, test performances, and final results were filed at the researcher's home. On completion of the study, all pertinent information concerning the participants was destroyed.

Analysis of Data

In order to maximize reliability and internal validity of the study, the researcher administered the two experimental tasks, scored the performances of the participants, and recorded the data. Differences between groups were determined by analysis of covariance (ANCOVA). The data for whom the children received interactive modeling was compared to the data for whom the children received passive modeling on 2 retention tests and 1 transfer test by 2 tasks. All retention scores and transfer scores were collected according to the Task Benchmark Scoring Sheets and the Transfer Benchmark Scoring Sheets.

The data were subjected to analysis of covariance using the pretest as the covariate. Two separate ANCOVAS were used to analyze the retention data: one on washing hands and one on donning a coat. A 2 (modeling) x 2(task) ANCOVA was used to analyze the results of transfer on washing a cup and the transfer test on donning a cardigan. The modeling techniques and the tasks were counterbalanced across the participants. Those participants who received interactive modeling in washing hands task received passive modeling in donning a coat. Similarly, those children that received passive modeling in washing hands received interactive modeling in donning a coat.

Two separate ANCOVAS were conducted to analyze the results of the retention and transfer data. A 2 way ANCOVA, 2(modeling) x 2(retention tests) with repeated measures on both factors was used to analyze retention effects. A 2 way ANCOVA, 2(modeling) x 2(tasks), with repeated measures on both factors was used to analyze transfer data. All analyses were conducted using SPSS for Windows, Version 9.0.

CHAPTER IV

Results

This study was conducted to evaluate the effectiveness of two training techniques, interactive modeling and passive modeling across two motor tasks, washing hands and donning a coat. Children with developmental delays served as participants in the quasi-experimental design. Task Benchmark Scoring Systems were created to measure retention and transfer phases of the two motor tasks of eight children with developmental delays. To establish face validity of the Task Benchmark Scoring Systems, two experts in the field of special education and two experts in the field of occupational therapy reviewed the scoring systems. The face validity results are presented in the first part of this chapter. In this chapter the results of the face validity, descriptive data for all participants, the results of the three retention phases, and the transfer phase are presented.

Face Validity of the Task Benchmark Scoring System

Two experts representing the special education field and two experts representing the occupational therapy field participated in the face validity aspect of the study. Experts 1 and 2 were special educators, and experts 3 and 4 were occupational therapists. A face validity package, including complete directions for using the Task Benchmark Scoring System and the Task Benchmark Scoring System Face Validity Questionnaire, was sent to the experts for their review. The results from the validation part of the study are presented through qualitative and quantitative analyses.

Based on the Task Benchmark Scoring System Face Validity Questionnaire (Appendix E), the data are divided into two sections: question 1a and 1b used a 3 point, Likert-type scale and were analyzed using quantitative analysis. Questions 2, 3 and 4 were open-ended questions and were analyzed using qualitative analysis. For both sections, a table summarizing the results is included. This is followed by the researcher's response to the experts' comments.

Quantitative Analysis

A 3 point, Likert-type scale was used to evaluate question 1a and 1b. Participants ranked the questions using the following: 1= Disagree, 2= Moderately agree, 3= Agree. The results are presented in Table 1.

Table 1

Quantitative analysis of experts' comments

Questions	Disagree		Mod. Agree		Agree	
	F	%	F	%	F	%
1a. Based on the results you would be able to estimate the effectiveness of the modeling technique?	0	0	2	50	2	50
1b. Based on the results you would be able to evaluate the subject's progress?	1	25	2	50	1	25

As illustrated in Table 1, the highest frequency of respondents and percent of respondents for question 1a was 50 percent. Based on these results, the 4 experts agree that the Task Benchmark Scoring Systems are useful in estimating the performance of participants.

The 4 experts had the greatest range in their frequency of response for question 1b. Experts 1, 2 and 4 agreed that the Task Benchmark Scoring Systems would enable an individual to evaluate progress, while expert 3 strongly disagreed. The reason for the low score may lie in the following statement made by expert 3, "No room for individual approaches to the task previously learned" (Table 2, 3b disadvantages). This is understood to mean, "How would you know progress was due to the Task Benchmark intervention?" In response to this comment, a pretest was used as a preliminary step to the acquisition phase of the study design for this thesis. If an individual gains knowledge of a task learned, then the Task Benchmark Scoring Systems can evaluate progress from pretest to acquisition, retention, and transfer phases of the study.

<u>Qualitative Analysis</u>

The final three questions of the face validity questionnaire used open-ended questions. The four experts were asked to state three advantages and three disadvantages of the Task Benchmark Scoring Systems and any other comments, recommendations, and concerns. Summarized in Table 2 are the experts' responses to questions 2, 3 and 4.

Advantages of the Task Benchmark Scoring System. The overall responses of the four experts to the first question 1a and 1b relates to the fact that there is consensus regarding the ease of using the Task Benchmark Scoring System. The comments such as "systematic", "quick and easy", "easy to score" support the Task Benchmark Scoring System's simplicity of use.

Disadvantages of the Task Benchmark Scoring System. Expert 3 expressed major disadvantages to the Task Benchmark Scoring System. Expert 3 stated, "does not provide enough information about performance". The purpose of this study is to further the scope of Biederman and colleagues' studies (1991; 1994; and 1998) and explore the difference in learning of two modeling techniques in three retention intervals and a transfer phase. Expert 4 expressed another concern stating, " Modification is needed for the physically challenged".

Table 2

Qualitative analysis of experts' comments

Questions	Expert 1	Expert 2	Expert 3	Expert 4
2a. Advantages	Systematic	Easy	Breaks down task	Quick and Easy
2b. Advantages	Easy to follow	Applicable to other disabilities	Easy to score	Not exclusive to D.D. children
2c. Advantages				Objectiveness of grading.
3a. Disadvantages	What happens if the child does step 1,2 and not 3,4 but continues 6,7,8?	Introducing a cup makes the task a more complex task.	No room for individual approach to task previously learned.	Unclear if a dishcloth is used to wash cup?
3b. Disadvantages			Does not provide enough information about performance.	
3c. Disadvantages			Not clear of child is scored low if a step is missed?	
4. General comments, recommendation, and concerns	If child does not follow the steps in the system, have they learned to do the task?	Modification is needed for those physically challenged.	Additional steps should be added to break down tasks further.	How effective is it with group therapy?

Although modification of the Task Benchmark Scoring System would probably be needed for the persons with physical disabilities, the intent of the study was to recruit participants who had no physical challenges. The application of the Task Benchmark Scoring System for children with physical disabilities was not explored in this study. Finally, expert 4 questioned the use of the Task Benchmark Scoring System in group therapy sessions. The participants were provided with one-on-one training in the acquisition phase, as well as individual testing in the retention and transfer phases of the study.

Expert 1 expressed concerns such as, "What would happen if the child does step 1, 2, 3 not 4, 5, 6 and continues 7 and 8?" also, "if child does not follow the steps in system, have they learned to do the task?" These important concerns correspond to major weaknesses in the Task Benchmark Scoring System. According to these concerns, the following revisions were considered.

For the purpose of this study, if a participant missed a step during retention phases of the study, yet continued to complete the task, that participant received a full score. Footnotes were added about the performance of each child during each phase of the learning process. This will assist in understanding each participant's performance. As for the measure of learning if a child skipped a step in the Task Benchmark Scoring

System and completes the task, but not exhibit the knowledge in the pretest, he or she is assumed to have learned the task through the study design.

Summary of Face Validity of Task Benchmark Scoring System.

Face validity was established by sending the Task Benchmark Scoring System and the Task Benchmark Scoring System Face Validity Questionnaire to four experts: two experts from the field of special education and two experts from the field of occupational therapy. The questionnaire included four questions. The first question and its two subsections were rated on a 3 point, Likert-type scale, and responses were analyzed quantitatively. The participants rated the questions using the following ranking: 1= Disagree, 2= Moderately Disagree, 3= Agree. For questions 2, 3, and 4, open-ended questions were analyzed qualitatively.

Findings from the quantitative analysis for question 1a (Table 1) indicated that all the experts agreed that the Task Benchmark Scoring System was an effective tool to estimate the effectiveness of the modeling techniques. Findings from the quantitative analysis for question 1b (Table 1) indicated that three out of four experts agreed that the Task Benchmark Scoring System would be able to evaluate the subject's progress.

Findings from the qualitative analysis (Table 2) indicated a need for some revision in the Task Benchmark Scoring System. Half of the experts stated concerns regarding actual scoring of those participants that skipped steps in the system, yet continued with the task. These important concerns were taken into consideration and the appropriate revisions were made in the study. Overall, face validity was established with minimal revision.

The Study

This study was conducted with eight children diagnosed with developmental delays. All of the children attended special education programs in a large Metropolitan school in Jerusalem, Israel. The following is a summary of the characteristics of the participants in the study.

Participants Characteristics

Participant characteristics are presented in Table 3. The participants' primary diagnoses included: Down syndrome (n=1), Cerebral Palsy (n=1), Developmental Delay (n=1), and Mental Retardation (n=5). The participants included 4 females and 4 males, ranging in age from 5 to 8 years, with IQ scores ranging between 40 and 55. The mean age was 6.7 years. The mean IQ score was 49.4.

Table 3

Participants' characteristics

Participant	Age (year+month)	Gender	Diagnosis	Mental IQ
1	6 year + 11 month	F	Mental Retardation	55
2	8 year + 1 month	M	Down syndrome	45
3	5 year + 3 month	M	Mental Retardation	55
4	6 year + 3 month	F	Cerebral Palsy	45
5	6 year + 2 month	F	Mental Retardation	45
6	7 year + 3 month	M	Developmental Delay	55
7	5 year + 11 month	M	Mental Retardation	40
8	8 year + 3 month	F	Mental Retardation	55

Pretest. Prior to beginning the acquisition phases of the study, a pre-test was performed to establish a baseline of previously learned knowledge of the two motor tasks. Neither physical assistance or verbal cues were provided by the researcher during the testing. The results of the pretest are presented in Table 4.

Table 4

Scores of the pretest for the participants

Participants	Wash Hands	Don Coat
1	0	0
2	2	1
3	2	1
4	2	1
5	0	0
6	2	1
7	0	0
8	2	1

Results of the Retention Testing

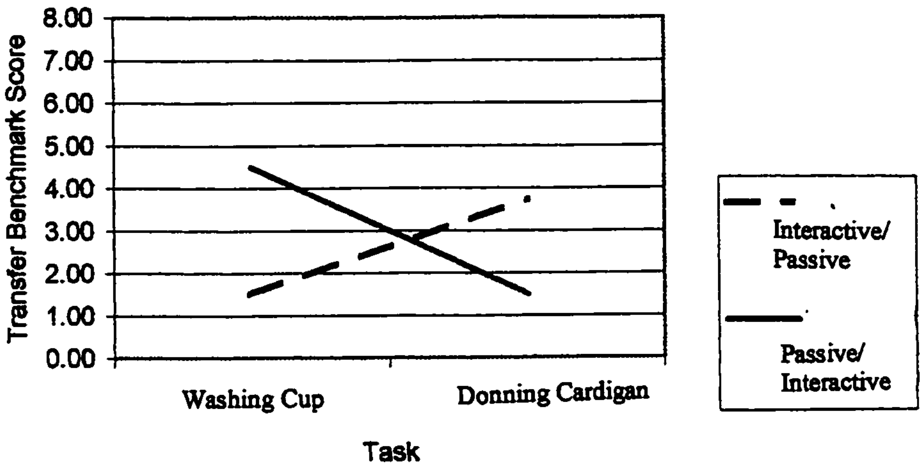
The main effect of modeling approached statistical significance (F 1,5 = 5.93, $p < .06$). Inspection of the means revealed that those who learned to don the coat using interactive modeling scored higher ($\underline{M}$ = 4.50, S = 1.73) on the Task Benchmark Scoring System than those who had passive modeling ($\underline{M}$= 3.00, S = 1.15). No other main effects or interactions were found to be statistically significant. All raw data concerning retention tests, and transfer phases are found in appendix L.

Results of the Transfer Phase

The transfer phase consisted of washing a cup and donning a cardigan. This phase immediately followed the fourth retention test. No verbal praise was provided during any of the transfer sessions.

The results of the transfer phase showed a significant interaction of the transfer task by modeling (F 1,6) = 9.52, $p < .05$). Inspection of the means revealed that the participants did best on the transfer task that resembled the task that they learned when modeling was interactive. The results of the transfer phase are summarized in Figure 1.

Figure 1. Interaction of modeling by transfer task.



Functional Implications

The results in this study indicated practical significance in its application to training children with developmental delays. By examining the retention of learning over three retention intervals, it is evident from the means that retention fro the interactive modeling technique tasks were higher than those means scored for the passive modeling technique tasks. This indicated that children trained in the interactive modeling technique retained the information over time better than the children trained in the passive modeling technique. A strong proof favoring interactive modeling was the comparison of pretest means with retention means of all three retention tests. The overall results indicated there was significant amount of learning across the participants. In the pretest, most participants scored no higher than a 2 in the 8 point Task Benchmark Scoring System for both motor tasks, this indicated that the participants were able to turn the water on or remove the coat off the hook only. After the acquisition phase, the majority of the participants scored on the higher end of the 8 point Task Benchmark Scoring System, specifically when the motor tasks were trained in the interactive modeling. Summarized in table 5 are the means and standard deviations by the modeling technique.

Table 5

Means and Standard Deviation by Modeling Technique

Model	PreWH	Pre DC	Rt1WH	Rt2DC	Rt3WH	Rt4DC	TrWC	TrDC
0								
M	1.20	.60	4.00	5.00	4.20	3.80	2.60	2.80
N	5	5	5	5	5	5	5	5
SD	1.10	.55	2.45	3.74	3.35	2.05	2.51	3.03
1								
M	1.33	.67	7.33	3.67	7.00	3.67	3.67	2.33
N	3	3	3	3	3	3	3	3
SD	1.15	.58	1.15	.58	1.00	.57	2.08	.58
Total								
M	1.25	.63	5.25	4.50	5.25	3.75	3.00	2.63
N	8	8	8	8	8	8	8	8
SD	1.04	.52	2.60	2.92	2.96	1.58	2.27	2.33

Note: PreWH=Pretest Washing Hands; PreDC=Pretest Donning a Coat; Rt1WH=First Retention test Washing Hands; Rt2DC=Second Retention test Donning a Coat; Rt3WH=Third Retention test Washing Hands; Rt4DC=Fourth Retention test Donning a Coat; TrWC=Transfer test Washing Hands; TrDC=Transfer test Donning a Cardigan.

The children trained in the interactive modeling technique also followed a similar pattern of performance in the transfer phase. The children scored higher on the transfer task that resembled the task trained in the interactive modeling than the other task trained in passive modeling, during the acquisition. These participants were able to generalize and transfer learned knowledge of the motor tasks trained in the interactive modeling,

CHAPTER V

Discussion

The present study examined the effects of passive and interactive modeling techniques in the retention and transfer phases of two upper extremity motor skill tasks. Children diagnosed with developmental delays served as participants. Type of modeling used during acquisition had no significant effect on the retention of learning of the washing hands task with the children. However, the interactive modeling technique enhanced retention for donning a coat though this finding just failed to be statistically significant ($p < .06$). Contrary to Biederman and his colleagues' findings (1991, 1994, 1998) interactive modeling showed a slight advantage over passive modeling in the retention of learning for children with developmental delays. These findings suggest that using interactive modeling as a training technique with motor tasks may be an effective method of training for children with developmental delays.

The results of the transfer phase of the study showed an even clearer perspective on the benefit of using interactive modeling technique when training children with developmental delays in motor tasks. These findings are significant to the study. Children did best on the transfer task similar to task they were given interactive modeling.

Contrary to the results of Biederman and colleagues (1991, 1994, 1998) this study demonstrated that interactive modeling is an effective training technique for children with developmental delays. This is an interesting finding since Biederman and colleagues' research (1991, 1994, 1998) suggested that passive modeling is a more effective training technique for children with developmental delays.

Based on Biederman and colleagues research, passive modeling is a tool for learning since passive modeling involves imitation by observation. According to Piaget (1951), early imitation is limited to behaviors in the repertoire of behaviors. More advanced imitation, emerges at the end of the sensorimotor period of child development. Then, imitation parallels intelligence as a whole. This is interesting since children with developmental delays often have some degree of mental retardation and hence, may have difficulty using imitation to facilitate learning. Kuhn et al. (1973) stated that, " imitative function undergoes transformation, as the individual develops. Thus, the level of structural organization of the individual specifies the general character of his [sic] imitation ..." (p. 163). Passive modeling may not be the ideal method of training children with developmental delays and those children labeled with severe mental retardation. Results of this study and those that preceded it, found interactive modeling as an effective training tool for children or those with developmental delays.

However, there are several questions that still remain unanswered following this study. These questions relate to the use of interactive modeling with: a) group sessions, b) children who have language difficulties, and c) children who are physically challenged. Questions related to using interactive modeling with children labeled with less severe mental retardation, and those children who related to age-appropriate models versus adult models. These issues are to be investigated in future studies.

Summary

Results of studies that used interactive modeling as a training tool found this type of modeling effective in training adults as well as children with developmental delays. However, Biederman and colleagues (1991,1994, 1998) performed three separate experiments concluding that the passive modeling technique was more effective than interactive modeling technique. In the Biederman and colleagues' studies (1991, 1994, 1998), children with developmental delays who were trained in the interactive modeling technique were compared with children with developmental delays who were trained in the passive modeling technique. The results of those studies concluded that the children trained in the passive modeling outperformed the children trained in the interactive modeling. However, retention and transfer phase of learning were not examined in Biederman and colleagues' studies. Therefore, if passive modeling was a better technique than interactive modeling, then such a claim should be measured in the retention and transfer phase of learning.

Two upper extremity motor tasks, washing hands and donning a coat were pre-chosen by the researcher. Eight children with developmental delays served as participants for the study. All eight children received blocked training in the two motor tasks. Four children were randomly assigned to an interactive modeling condition followed by a passive modeling training condition. The other four children were randomly assigned to a passive modeling condition followed by an interactive modeling training condition. While the children were in the interactive modeling condition they received verbal prompts at successful benchmarks. The children in the passive modeling condition received no verbal prompts. The results of this study showed that the interactive modeling technique enhanced retention for donning a coat, though this finding just failed to be statistically significant ($p < .06$). However, the clearer picture is evident in the transfer phase of the study. Children did best on the transfer task similar to the interactive modeling task they were given. This suggests that the interactive modeling technique is an effective modeling tool for training children with developmental delays in motor tasks.

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Appendix A
Participant Demographic Data Sheet

Participant's Demographic Data Sheet

Participant's Name:________________________

Code #:______________

Age of Participant:____________

Medical Diagnosis:______________

Mental IQ:______________

Comments:____
____
____
____
____

Appendix B

Protocol for Review by the HS-IRB

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Protocol for Review by the HS-IRB

The purpose of this study is to examine the effects of interactive modeling and passive modeling in the retention and transfer phase of motor skill learning for children with developmental delay. The hypotheses of the study investigate the following two statements:
a) Modeling technique will not affect scores on the task benchmark scales for the retention phase; and
b) Modeling technique will not affect scores on the transfer task benchmark scales for the transfer phase.

Methods: Eight children with developmental delays will participate in this study. The children will range between the ages of 5 and 8 years, and will be selected for the study according to the following guidelines:
a) The children are currently attending a special educational program,
b) Have an IQ range between 40 and 55,
c) Have been labeled as having severe mental retardation, and
d) Have been diagnosed as children with developmental delay.

The children will be recruited from one of the elementary schools that provide special education in their curricula in the city of Jerusalem, Israel. With the assistance of the special education teacher a letter will be sent out to prospective parents briefly explaining the study and why their child may be an appropriate participant. The letter will also include an invitation to the parents to attend a meeting where additional information on the study will be provided and questions will be answered.

Although no monetary gains will be awarded, the participants will benefit from being trained in two self-care activities. The children will also be exposed to one of two modeled training approaches. The two approached may identify successful learning preferences for the children. No risks have been identified in the study.

Other than the guidelines described in the above section of this protocol, subjects will not be specifically identified in the study. All names will be withheld to the public. To guarantee confidentiality of the participants, a numerical coding system will be used in order to protect the participants. The results of the all the tasks performances will be referenced in the study in the form of codes. Each child will be assigned a code. This code in turn will be referred to in the result section of the study. All materials and information concerning the participants, the participants' performance scores in the three retention tests and the one transfer test, and data results will be filled in a cabinet at the researcher's home.

Materials and Devices: For the purpose of this study, an 8 point task benchmark scale was conceptualized in order to measure the participant's learning process. This benchmark system was again replicated for the transfer phase of the study, with two comparable tasks. This task and transfer benchmark scale system will be sent out to professionals in the area of Occupational therapy and special education to evaluate face validity. Adjustments will then be made to the scale in accordance to the suggestions and comment of the professionals.

During the study most of the materials will be provided by the researcher, such as soap, towels, and a plastic cup. Each participant will be asked to provide a coat and a cardigan from home. The coat and cardigan will remain with the researcher and later returned to the participants at the end of the study.

Procedure: A child from the interactive modeling condition will be trained in the task of washing hands by the researcher. The training session will begin by informing the child about the purpose of the session: " I will be teaching you how to wash your hands with soap and water. I will be taking your hands and showing you how to wash them. I want you to pay attention. When we are done you can return to your class. Let's start". Following the instructions, the researcher will begin training the child, step by step, according to the following 8 steps:

Step 1, turns water on
Step 2, wets hands
Step 3, takes soap into hands
Step 4, lathers hands
Step 5, returns soap
Step 6, rinses hands
Step 7, turns water off
Step 8, dries hands with towel

When the child achieves a benchmark successfully verbal prompts will be provided by the researcher. Similarly, the child receiving the passive modeling condition will begin the session with the following statement by the researcher: "I will be showing you how to put on a coat. You will listen to my words and watch me. I want you to pay attention. When I am done, you can return to your class. Let's start". During the passive modeling by the researcher no verbal prompts are delivered. Following the instructions, the researcher will model the task for the child, step by step, according to the following 8 steps:

Step 1, reaches for coat
Step 2, removes coat from hook/hanger
Step 3, positions coat right side up
Step 4, places one arm in appropriate armhole
Step 5, brings coat around shoulders
Step 6, places other arm in the appropriate armhole
Step 7, engages in zipper/buttoning
Step 8, completes closure of coat

In the first two retention phases each child will be informed of the following: "I want you to wash your hands/put on your coat without me helping you or showing you. You have 20 minutes to finish. When you are done, you can return to your classroom. You can start now ". Following the instructions, the researcher will score the child's performance according to the 8 point Task Benchmark Scoring Sheet Washing Hands/Donning Coat.

In the third retention testing session, each child will be informed of the same information as in the first two retention tests. However, two performances by each child will be expected, washing hands and then donning coat or visa versa, in a single testing session. Following each performance, the child will be scored according to the 8 point Task Benchmark Scoring Sheet Washing hands and the 8 point Task Benchmark Scoring Sheet Donning Coat.

In the transfer phase of the study, each child will be informed of the following: "Here is a cup/cardigan. I want you to wash the cup/put on the cardigan. I cannot help you. Do the best you can. You can start now". Following the instructions, the researcher scores the performance of each child according to the following 8 steps:

Step 1, turns water on
Step 2, wets cup
Step 3, takes soap into hands
Step 4, washes cup
Step 5, returns soap
Step 6, rinses cup
Step 7, turns water off
Step 8, dries cup with towel

Following the first transfer task of washing a cup, the child will then perform the second transfer task according to the following 8 steps:

Step 1, reaches for cardigan
Step 2, removes cardigan from hook/hanger
Step 3, positions cardigan right side up
Step 4, places one arm in appropriate armhole
Step 5, brings cardigan around shoulders
Step 6, places other arm in the appropriate armhole
Step 7, engages in zipper/buttoning
Step 8, completes closure of cardigan

The study will be performed by the researcher, on the school premises, and in a classroom designated by the school officials.

Appendix C
Protocol for Facility Use
And
SJSU Letter of Acceptance of Thesis

עיריית ירושלים
המינהלה לחינוך ירושלים
بلدية اورشليم القدس
إدارة المعارف اورشليم القدس

ירושלים

מדינת ישראל
משרד החינוך התרבות והספורט

AL/AMAL SCHOOL

JULY,15,2000

To Whom it may concern

We acknowledge that **A.Suaifa Imam-Jaber** is performing an experiment in the month of July, the year 2000 in Jerusalem / Israel, and as a staff of AL/AMAL School in Jerusalem we are interested in the result of that experiment.

Sincerely yours

director of school
Suhila Abu Goush

San José State
UNIVERSITY

Office of the Academic Vice President
Associate Vice President Graduate Studies and Research
One Washington Square
San José, CA 95192-0025
Voice: 408-924-2480
Fax: 408-924-2477
E-mail: gstudies@wahoo.sjsu.edu
http://www.sjsu.edu

TO: Amina Suaifa Imam-Jabar
474 Fullerton Court
San Jose, CA 95111

FROM: Nabil Ibrahim, N Ibrahim
AVP, Graduate Studies & Research

DATE: May 19, 2000

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

"Effects of Modeling on Retention and Transfer of Two Motor Tasks"

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project, and with regard to any and all data that may be collected from the subjects. The Board's approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Nabil Ibrahim, Ph.D., immediately. Injury includes but is not limited to bodily harm, psychological trauma and release of potentially damaging personal information.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2480.

Appendix D
Letter to Parents

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Date_______

Dear Parents,

I am a graduate student majoring in Human Factors/Ergonomics at San Jose State University. I am currently working on my Master's thesis research. I would like to recruit eight children to participate in my study. With the assistance of your child's primary classroom teacher, your child has been chosen as a good candidate for the study.

The purpose of my study is to teach your child two self-care activities, washing hands and putting on a coat, using two different teaching methods. I will compare the performances of your child in a memory test (retention). After the training sessions and retention tests, I will ask your child to perform a similar activity and test his or her transfer ability to a new but related task. In this way, the results of your child's performances will help me evaluate which teaching method showed superiority during the training sessions.

A meeting will be held, at your child's school, to further explain the study in detail and answer all your questions and concerns. Following the meeting, a consent form will be passed out explaining, in great detail, your child's role as a participant in this study. This consent form must be signed prior to your child's participation in the study.

Initial__________

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

I appreciate your time and cooperation. Please feel free to contact me at 02-6789-243 for any questions or additional information that may help you with your decision. I hope to see you at the meeting.

Thank you,

A. Suaifa Imam-Jaber

Appendix E

Agreement to Participate in Research study

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

Agreement to Participate in Research Study

Responsible Investigator: Amina Suaifa Imam-Jaber

Title of Protocol: Effects of Modeling on Retention and Transfer

Your child has been asked to participate in a research study investigating the effects of the passive and interactive modeling techniques on the retention and transfer phases of learning of two upper extremity motor skill tasks with children diagnosed with developmental delays. Your child will be randomly assigned either to an interactive modeling group or to a passive modeling group, where your child will be trained in washing hands for one week, and trained in putting on a coat during the following week.

Your child will participate in eight training sessions, four retention tests, and two transfer tests, for a period of 14 days. The study will occur during school hours and on the school premises. Each training session will last for a maximum of 20 minutes. To minimize distractions, and obtain full attention from the child, your child will be removed from the classroom and taken to an empty room that will be pre-arranged and assigned to the researcher by the school.

The materials for the experiment will be provided by the researcher: soap, towels, and a plastic cup. I ask that your child bring a coat and a cardigan from home. The coat and cardigan will remain with the researcher, and then returned to the child at the end of the study. No risks to your child's well being have been identified with this study.

Initials____________

The participation of your child in this study will expose him or her to learning two self-care tasks. Your child will also benefit from identifying which of the two training methods suits his or her learning style. The results of the study may be published but no specific information identifying your child will be included. If your child does "not participate" in this study, he or she will not be penalized or jeopardized in any way.

During the retention tests and the transfer phase of the study, the children may exhibit distress and frustration due to unsuccessful performances. Following the testing time and the scoring of your child's performance, the researcher will intervene providing physical assistance and positive verbal reinforcements. Consequently, your child will successfully complete the motor tasks provided during the study and gain a sense of pride and self-confidence. Upon completion of the study, your child will be given a golden star (sticker) in appreciation for participating in the study. Your child will be thanked and praised for all of his or her hard work.

Any questions or concerns about the study can be addressed to A. Suaifa Jaber, at 02-6789-243. Complaints about the research can be presented to the Department Chair of Human Performance, Dr. Carol L. Christensen, at 408-924-3010. Questions about research, subject's rights, or research-related injury can be presented to Nabil Ibrahim, Ph.D., Associate Vice President for Graduate Studies and Research, at 408-924-2480.

Initials__________

After reading and fully understanding your child's role in the following study and giving full consent for your child's active participation in this research study, your child is free to withdraw from the study at any time without penalty or prejudice to your child's relationship with the researcher or with San Jose State University.

__________________	__________________
Name of Child	Parent Signature
__________________	__________
Relationship to Child	Date
______________________________	____________
Investigator Signature	Date

Appendix F
I Will Not Help Slip

I Will Not Help Slip

During the course of the research study, I will agree not to help my child with any of the tasks that he or she will be trained in. I understand that for my child to benefit from this learning experience, I must not help him or her at home. I also understand that my "help" will be detrimental to the results of the study.

____________________	________________	__________
Parent Signature	Name of Child	Date

____

Investigator Signature

Date__________

Appendix G

Task Benchmark Washing Hands

Task Benchmark Score Sheet 1

Washing hands

0_____No performance
1_____turns water on
2_____wets hands
3_____takes soap into hands
4_____lathers hands
5_____returns soap
6_____rinses hands
7_____turns water off
8_____dries hands with towel

Comments:

Appendix H
Task Benchmark Donning a Coat

Task Benchmark Score Sheet 2

Donning Coat

0_____No performance
1_____reaches for coat
2_____removes coat from hook/hanger
3_____positions coat right side up
4_____places one arm in appropriate armhole
5_____brings coat around shoulders
6_____places other arm in the appropriate armhole
7_____engages in zipper/buttoning
8_____completes closure of coat

Comments:
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Appendix I

Face Validity Package

San José State
UNIVERSITY

College of Applied
Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

A. Suaifa Imam-Jaber
474 Fullerton Ct.
San Jose, Ca. 95111
Home Phone: (408) 226-5119
E-mail Address: Suaifa@aol.com

Dear Professionals;

I am a graduate student majoring in Human Factors/ Ergonomics at San Jose State University. I am currently working on my Master's thesis research. In my research, I am using a benchmark scoring system that will measure the retention of developmentally delayed children in an upper extremity motor task. The aim of this study is to examine the comparative effectiveness of two self care motor tasks, one trained in an interactive modeling technique and the other in a passive modeling technique. The Task Benchmark Scale will be presented as both the teaching tool as well as the measuring scale of the two motor tasks. You have been selected as an expert to evaluate the face validity of the Task Benchmark Scale. I hope you will help evaluate my work.

Enclosed is a package of information regarding the task breakdown and the scaling structure. I ask you to review the validity of the scale. I have also enclosed a short questionnaire. Please feel free to E-mail me or call me if you have any questions regarding the test items. Please feel free to comment on any changes, or adjustments needed. Your feedback is greatly valued.

San José State
UNIVERSITY

College of Applied Sciences and Arts
Department of Human Performance
One Washington Square
San José, CA 95192-0054
Voice: 408-924-3010
Fax: 408-924-3053

I truly appreciate your time and cooperation. If it is convenient for you, it would be very helpful if I could receive your review within the next week.

Thank you,

A. Suaifa Imam-Jaber

Benchmark Scaling System

Acquisition Phase and Retention Phase

Attached is the 8 point Task Benchmark Scoring Sheet Washing Hands, and Task Benchmark Scoring Sheet Donning Coat that I will be using to measure the retention of eight developmentally delayed children. The specific breakdown of the tasks was developed not only as a means for teaching/training the participants in an upper extremity motor task, but most importantly, as a measuring tool for the effectiveness of the interactive modeling retention condition and the passive modeling retention condition. The objective of the study will be to evaluate the effectiveness of the two modeling techniques, in retention phases and in the transfer phase of learning using two motor skill tasks, washing hands and donning a coat.

The following is the step-by-step break down of the two tasks and the scoring system:

Washing Hands

0_____No performance
1_____turns water on
2_____wets hands
3_____takes soap into hands
4_____lathers hands
5_____returns soap
6_____rinses hands
7_____turns water off
8_____dries hands with towel

Donning Coat

0_____No performance
1_____reaches for coat
2_____removes coat from hook/hanger
3_____positions coat right side up
4_____places one arm in appropriate armhole
5_____brings coat around shoulders
6_____places other arm in the appropriate armhole
7_____engages in zipper/buttoning
8_____completes closure of coat

Acquisition Phase. In the acquisition phase, the researcher will administer the task of washing hands and donning a coat by training the participants step by step according to the 8 point scaling system. The training technique will be administered to half of the participants in the interactive modeling technique and the other half in the passive modeling technique.

Interactive modeling technique. The participant will be led through the task as the researcher models the activity and encourages the participant to try to perform the task. Verbal prompts will be given throughout the training sessions.

Passive modeling technique. The participant will be told to observe the researcher model the task. The participant will not participate during the modeling. Subjects will be able to attempt the task, but no verbal prompts will be delivered to the participant during the passive modeling condition.

Retention Phase. In the retention phase, the children will be asked to perform the newly acquired tasks, washing hands and donning a coat. No physical assistance nor verbal prompts will be provided to the participants. In accordance to their performances, the participants will be scored based on the 8 point scoring sheets.

Also attached are the 8 point Transfer Task Benchmark Scoring Sheets 1 and 2 that I will be using in the transfer phase of the study. The breakdown and scoring of the 8 point Transfer Benchmark Scoring Sheets are identical to the 8 point Task Benchmark Scoring Sheets, but using two comparable tasks, washing a cup and donning a cardigan. The following is the step-by-step of the two transfer tasks and the scoring system:

Washing Cup

0_____No performance
1_____turns water on
2_____wets cup
3_____takes soap into hands
4_____washes cup
5_____returns soap
6_____rinses cup
7_____turns water off
8_____dries cup with towel

Donning Cardigan

0_____No performance
1_____reaches for cardigan
2_____removes cardigan from hook/hanger
3_____positions cardigan right side up
4_____places one arm in appropriate armhole
5_____brings cardigan around shoulders
6_____places other arm in the appropriate armhole
7_____engages in zipper/buttoning
8_____completes closure of cardigan

Transfer Phase. In the transfer phase of the study, the participants will be asked to perform washing a cup and donning a cardigan without any assistance, or verbal prompts. They will be allowed 20 minutes to complete each of the tasks. In accordance to their performances, the participants will be scored based on the 8 point scoring sheets.

Please feel free to call or E-mail me for further explanations regarding the study. Thank your for you time and cooperation.

A. Suaifa Imam-Jaber
Phone #: 408-226-5119
E-mail Address: Suaifa@aol.com

Name.. Date..........................

Tasks Benchmark Scoring System
Face Validity Questionnaire

Directions: Please rate and fill out the following questions using this scale:

1= Disagree; 2= Moderately agree; 3= Agree

1. Based on the test results, you would be able to:
   a) Estimate the effectiveness of the modeling Technique;

      1 2 3

   b) Evaluate the subject's progress;

      1 2 3

2. State 3 advantages in using the Benchmark Scoring System

   1...
   2...
   3...

3. State 3 disadvantages in using the Benchmark Scoring System

   1...
   2...
   3...

4. Do you have any comments, recommendations or other concerns in regard to the Benchmark Scaling System?...

....

Appendix J

Transfer Task Benchmark Washing a Cup

Transfer Benchmark Scoring Sheet 1

Washing Cup

0_____No performance
1_____turns water on
2_____wets cup
3_____takes soap into hands
4_____washes cup
5_____returns soap
6_____rinses cup
7_____turns water off
8_____dries cup with towel

Comments:

Appendix K

Transfer Task Benchmark Donning a Cardigan

Transfer Benchmark Scoring Sheet 2

Donning Cardigan

0_____No performance
1_____reaches for cardigan
2_____removes cardigan from hook/hanger
3_____positions cardigan right side up
4_____places one arm in appropriate armhole
5_____brings cardigan around shoulders
6_____places other arm in the appropriate armhole
7_____engages in zipper/buttoning
8_____completes closure of cardigan

Comments:

Appendix L
Raw Data

Subid	Model	PreWH	PreDC	Rt1WH	Rt2DC	Rt3WH	Rt4DC	TrWC	TrDC
1	1	0	0	8	3	7	3	3	3
2	1	2	1	8	7	8	7	7	8
3	1	2	1	8	4	8	4	6	2
4	1	2	1	6	4	6	4	2	2
5	0	0	0	4	0	0	2	1	0
6	0	2	1	2	8	4	4	2	2
7	0	0	0	4	2	2	2	2	2
8	0	2	1	2	8	7	4	1	2

Note: Subid=Participant Identification code; Model 1=interactive; Model 0=passive; Pre WH=Pretest Washing Hands; Pre DC=Pretest Donning a Coat; Rt1WH=First Retention test Washing Hands; Rt2DC=Second Retention test Donning a Coat; Rt3WH=Third Retention test Washing Hands; Rt4DC=Fourth Retention test Donning a Coat; TrWC=Transfer test Washing Hands; TrDC=Transfer test Donning a Cardigan.